



## Försättsblad Prov Original

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| Kurskod     | Provkod  | Tentamensdatum      |
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| Kursnamn    | Miljövetenskap AV, Metodik ur systemperspektiv |                     |
| Provnamn    | Tentamen                                       |                     |
| Ort         | Östersund                                      |                     |
| Termin      | H18  |                     |
| Ämne        | Miljövetenskap                                 |                     |

## **Exam for MX003A, Methodology from a systems perspective, 7,5 credits**

**Date:** 2018-11-09

**Time:** 5 h

**Aids:** Language dictionary, calculator

**Teachers:** Erik Grönlund (070-392 24 81)

**Instructions:**

Mark each paper with the *question number and your personal examination code that is provided to you.*

Maximum score 50 points (p). Minimum required score to pass 25 p.

Good Luck!

Erik

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### CHAINET report

**Question 1.** (10p). Types of systems analysis tools

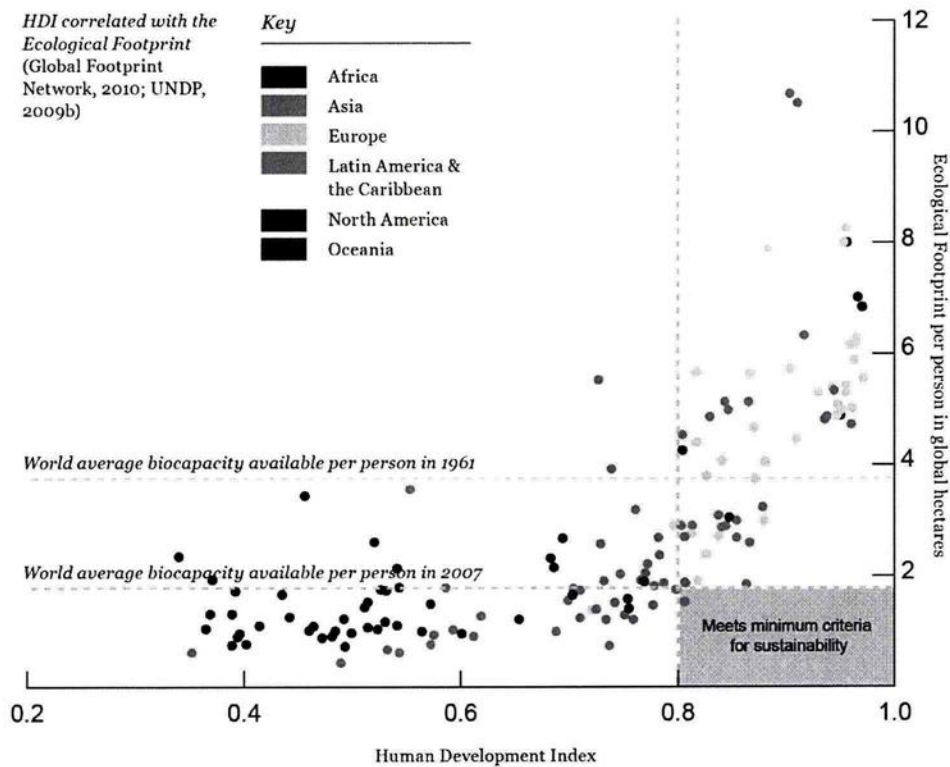
- a) Describe the difference between analytical and procedural systems tools, and give an example of each.
- b) Describe the difference between function oriented and region oriented systems tools, and give an example of each.

### Methodology questions.

**Question 2.** (10p). Compare 5 methods from your environmental assessment toolbox, by presenting their major strengths and weakness'.

**Question 3.** (5p). Describe the principal ideas behind MFA and SFA.

**Question 4.** (5p). In the Living Planet Report there is a map presenting “The footprint and human development”. Explain the diagram, its principles and its result.



**Question 5.** (5p). You are working at the sustainability department at a company producing cars, and from the company CEO you are asked to suggest two methods to back up the company’s claims of sustainability. Which two methods would you suggest, and why?

**Question 6.** (5p). You are working at a sustainability department for a country, and your minister ask you to suggest two methods to back up claims of sustainability on the national level. Which two methods would you suggest, and why?

## LCA applications

**Question 7.** (5p). Draw a flowchart for the following (simplified) industrial system:



A metal product, WS (a simple woodstove, see picture), is produced in plant Z, where metal sheets are cut and pressed to form the product WS. Plant Y delivers the metal sheets to plant Z. In plant Y, ingots are melted and rolled into sheets. The ingots come from plant X where iron mineral is extracted, turned into metal and cast into ingots. Plant X is situated 400 km from plant Y and the ingots is transported to plant Y by truck. Plant Y is situated 800 km from plant Z and the metal sheets are transported also to Z by truck. In the production of WS in plant Z there is also some process scrap (pieces of metal clippings from the cutting of the metal sheets). The process scrap is sent back to plant Y where it is melted together with the “new” metal and rolled into sheets.

The flowchart should include all the activities in the system. Each plant is to be considered an activity of its own. Also transportation is to be considered as an activity. It is not necessary to make a detailed description of all the process steps inside the plants. Represent the flow of material from plant to plant by arrows. Indicate what goes in (raw material) and comes out (product) from each plant.

**Question 8.** (5p). Perform data normalization at Plant X (from the previous question) for the following inputs and outputs according to the Annual environmental report for Plant X.

### Annual environmental report for Plant X

|                               |  |
|-------------------------------|--|
| Products from Plant X:        | Metal ingots of iron (Product X)         |
| Raw material to Plant X:      | Iron mineral (raw X)                     |
| Total annual production:      | 500 kg of X/year                         |
| Use of raw material:          | 2000 kg raw X/year                       |
| Use of energy in the process: | 1000 MJ/year, from oil combustion        |
| Emissions to air:             | 50 kg HCl/year (HCl = hydrochloric acid) |
| Emissions to water:           | 50 kg Cu/year (Cu = Cupper)              |
| Non-hazardous solid waste:    | 1500 kg solid waste/year                 |